

# PATENT SPECIFICATION

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## (54) IMPLANT PROSTHESES FOR DENTISTRY.

(71) We, ALFRED EDWARD EDELMAN and LEONARD IRWIN LINKOW, both citizens of the United States of America, respectively of 2723 Federal Street, Camden, State of New Jersey and 30 Central Park South, New York, State of New York, both in the United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to improvements in implant dentistry. More particularly, the invention relates to intraosseous posts and to improved techniques for their clinical employment in fixed oral reconstruction.

In the prior art practice of dentistry a preliminary to the provision of fixed bridgework is the consideration of abutment teeth to anchor the prosthesis and afford the stabilization and support essential to proper oral functioning. Where the patient is wholly lacking in abutment teeth or where oral conditions due to age or trauma are such as to negative consideration thereof as an anchoring medium, the prospect of fixed bridgework as a remedial measure is dimmed. In some cases resort may be had to modifications of fixed bridgework exhibiting a greater degree of sophistication. Illustrative of the latter are cantilever bridges including unilateral and bilateral partial dentures. However, the cantilever bridge has the inherent disadvantage of limited application and limited rigidity.

Relatively recent approaches to the problems attendant the provision of anchoring means for fixed bridgework have been taken in the so-called "implant" dentistry field. In this regard, however, successful implantation has been limited to that of the subperiosteal type. The technique therefor is involved due to the extreme difficulty in obtaining an adequate cortical bone impression prior to surgical separation of the periosteum from the alveolar bone. Of necessity, highly skilled and trained technicians are required. At least two visits to

[Price 5s. 0d. (25p)]

the dentist by the patient are required with a minimum three week interval therebetween. Consequent post operative sutures and swelling are the rule. Further, the subperiosteal technique is not available in the majority of cases where alveolar bone is present in substantial amounts.

According to one aspect the invention provides an implant post, for dentistry, including an intra-osseous portion rigidly affixed to and extending from a coronal portion, the intra-osseous portion having a radially vented axially extending cavity which is open at the end of the intra-osseous portion remote from the coronal portion.

The coronal portion is preferably axially aligned with the intra-osseous portion and the intra-osseous portion may be generally cylindrical.

The intra-osseous portion may include a continuous or discontinuous external thread which may be self tapping.

A spring may be disposed in the cavity and have portions extending through the vent or vents, forming the venting, and maintained in this extended position by the action of the spring.

The venting may comprise a helically extending elongate vent defined by a helical member which forms the intra-osseous portion and the helical member may be a spring.

The intra-osseous portion may be constructed, at least in part, by axially extending spaced apart ribs and a thread, which is continuous or discontinuous and if discontinuous is in discrete parts each at least one helical turn long, formed about and affixed to the ribs.

In order that the invention may be understood, various embodiments will now be described, by way of example, with reference to the accompanying drawings in which:

Fig. 1 depicts an embodiment of the inventive implant post;

Fig. 2 depicts a cross-sectional view through 2—2 of Fig. 1;

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Figs. 3 and 5 depict embodiments of inventive implant posts suitable for use in fresh extraction cases;

5 Figs. 4 and 6 depict cross-sectional views through 4—4 of Fig. 3 and 6—6 of Fig. 5, respectively;

Fig. 7 depicts an embodiment of an inventive implant post which is a modification of that depicted in Fig. 1;

10 Figs. 8 and 9 depict embodiments of inventive hollow cylindrical implant posts for retaining an axial core of alveolar bone;

Fig. 10 depicts a cross-sectional view through 10—10 of Fig. 9;

15 Fig. 11 depicts a helical embodiment of an implant post;

Fig. 12 depicts an embodiment utilizing a plurality of the intra-osseous portions similar to those shown in the implant post of Fig. 11.

20 The embodiment of Figs. 1 and 2 involves a threaded implant post. A continuous threaded portion 36 is provided about a hollow core. Two or more vertical ribs 37 extend axially from coronal portion 35 and are affixed to threaded portion 36 at points radially inwardly to provide support therefor. For attachment of copings, dentures and the like, screw 38 is shown threaded into the top of coronal portion 35.

25 In the case of fresh extractions implant posts such as shown in Figs. 3, 4 and 5, 6 may be employed. Fig. 5 depicts an egg-beater type implant post comprising coronal portion 45 atop ribs 46. Bone regeneration through and around ribs 46 provides a locking mechanism for this embodiment. The same mechanism is effective in the case of the bird cage type post of Fig. 3 which shows coronal portion 40 atop ribs 41 affixed to base ring 42.

30 The post depicted in Fig. 7 is a modification of that shown in Fig. 1. It comprises coronal portion 60 atop solid threaded portion 61 from which emanate vertical ribs 62 extending axially to ring 63 to which they are affixed. Bone regeneration through ribs 62 and ring 63 provides additional anchoring strength to that afforded by the threads of threaded portion 61. As in the case of Fig. 1 it is contemplated to accelerate bone regeneration by employing a hollow cylindrical drill to retain a core of bone between ribs 62 and ring 63.

35 The implant post depicted in Fig. 8 comprises a coronal portion 65 from the base of which emanates a hollow conical portion 66 preferably having an oblique apex angle. This structure caps a hollow cylindrical portion 67 having an open base. Cylindrical portion 67 may be ribbed, comprise rigid wide mesh material, or be provided with holes as shown.

40 The primary purpose of such construction is to permit bone regeneration through

the openings of the cylinder wall to anchor the implant post. It is contemplated to effect implantaion by initially drilling through the alveolar ridge with a drill shaped substantially as the implant post of Fig. 8. This drill differs structurally from its corresponding post in that an extended shank, preferably of circular cross-section, is employed in place of coronal portion 65 for use in conjunction with a chuck. The base of cylindrical portion 67 in the drill may be flared outwardly slightly and have a beveled inner edge to which an abrasive suitable for drilling bone may be affixed. An abrasive such as diamond grit is preferred. In another embodiment of such drill the base of cylindrical portion 67 may contain saw teeth to facilitate drilling through the bone. Employment of such a drill permits retention of a core of bone which fills the hollow cylindrical portion 67 thereby substantially reducing the necessary period for bone regeneration activity to lock the implant post.

45 The embodiment of Figs. 9 and 10 comprises a post for use in bone having insufficient hardness to maintain threaded and other posts in a rigid state. This post comprises tubular member 70 having a plurality of ports 72 symmetrically arranged about the longitudinal axis of said member and an inner threaded portion at its upper end. The ports 72 all lie in a transverse plane intermediate the ends of tubular member 70. Spring 71 may be continuous as shown in Fig. 10 or may be interrupted. The essential feature of spring 71 is that it be adapted to seat within tubular member 70 at the transverse plane of ports 72 and to bias sections of its length through each of said ports. A coronal portion 73 is adapted to screw into the threaded portion of tubular member 70.

50 Fig. 11 shows an implant post of a screw or threadlike design which has a length substantially in excess of the diameter. This post is constructed of substantially rigid material and comprises coronal portion 80 joined to a helical spring portion 81 having a hollow bore axially therethrough.

55 The implant posts, according to Figure 11, provide considerable flexibility in affording intra-osseous anchors since they may be implanted at any desired angle. The implant post of Figure 11 may be modified by the inclusion of multiple intra-osseous portions. An illustration of a typical application involving multiple intra-osseous portions is shown in Figure 12. In this figure three intra-osseous portions of the threaded type are shown implanted at various angles through cancellous and cortical bone material. The angles selected are designed to avoid areas insufficient in bone matter. The coronal portion of this construction

may comprise three parts, one for each intra-osseous portion, which are rigidly joined together by a cap of plastic, such as "Teflon", (Registered Trade Mark) to form the single coronal portion.

While the invention has been described and illustrated in connection with certain specific embodiments, it is expressly understood and will be readily apparent to those skilled in the art that various changes and modifications may be made without departing from the scope of the invention. For example, any of the inventive implant posts may be modified to permit a screw to be used with the coronal portion as shown in Fig. 1 and spacer means with or without means for carrying splints may be used in conjunction therewith. Further, it is contemplated that the inventive pins and posts may be coated with stimulants for osteoblastic activity, such as chondroitin sulfate and mucopolysaccharide extractions from Irish sea moss. The technique employed for promoting bone growth in conjunction with implantation also contemplates intra-osseous injection of such stimulants through axial bores of the pins and posts as well as mucosal injection of stimulants for fibroid activity through lateral bores of the implants. In addition to the use of stimulants for implant coatings, there is contemplated the use of heterogeneous bovine bone having all antigenicity removed as well as Teflon for such coatings. While it is contemplated that the materials of construction of the inventive implant posts and pins will be substantially inert with regard to oral environment and conditions, such materials do not form a part of the present invention.

#### WHAT WE CLAIM IS: —

1. An implant post, for dentistry, including an intra-osseous portion rigidly affixed to and extending from a coronal portion, having a radially vented axially extending cavity which is open at the end of the intra-osseous portion remote from the coronal portion.

2. An implant post according to claim 1, wherein the intra-osseous portion is generally cylindrical.

3. An implant post according to claim 2, wherein the intra-osseous portion includes a continuous or discontinuous external thread.

4. An implant post according to claim 3, wherein the thread is a self-tapping thread.

5. An implant post according to claim 3 or 4, wherein the vent or vents, forming the venting, is or are arranged to be substantially in the root of the thread.

6. An implant post according to any one of the preceding claims including a spring disposed in the cavity and having

portions extending through the vent or vents, forming the venting, and maintained in this extended position by the action of the spring.

7. An implant post according to any one of the preceding claims, wherein the venting comprises axially extending elongate vents defined by ribs.

8. An implant post according to claim 7, wherein the ribs are of smaller circumferential width than the circumferential width of the vents.

9. An implant post according to claim 7 or 8, wherein there are two, four or eight equally circumferentially spaced said ribs.

10. An implant post according to claim 2, wherein the venting comprises a helically extending elongate vent defined by a helical member which forms the intra-osseous portion.

11. An implant post according to claim 10, wherein the member is a helical spring.

12. An implant post according to claim 10 or 11, wherein the coronal portion is not axially aligned with the intra-osseous portion and a plurality of intra-osseous portions, each comprising a said helical member, are affixed to a single coronal portion.

13. An implant post according to any one of claims 1 to 5, wherein the intra-osseous portion is constructed, at least in part, by axially extending spaced apart ribs and a thread, which is continuous or discontinuous and if discontinuous is in discrete parts each at least one helical turn long, formed about and affixed to the ribs.

14. An implant post according to any one of the preceding claims, wherein the intra-osseous portion is coated with a plastics material.

15. An implant post according to claim 14, wherein the plastics material is polytetrafluoroethylene.

16. An implant post according to any one of the preceding claims, wherein the intra-osseous portion is coated with antigenicity-free heterogenous bovine bone.

17. An implant post according to any one of the preceding claims, wherein the intra-osseous portion is coated with a stimulant for osteoblastic activity.

18. An implant post according to any one of the preceding claims, wherein the coronal and intra-osseous portions are integrally formed.

19. An implant post according to any one of claims 1 to 17, wherein the coronal and intra-osseous portions are interconnected by threads.

20. An implant post according to any one of the preceding claims, wherein the coronal post is of polygonal cross-section or is cylindrical.

21. An implant post according to any one of the preceding claims, wherein the

coronal portion includes, at the end thereof remote from the intra-osseous portion, attachment means for the attachment of dental devices thereto.

5 22. An implant post according to claim 1, wherein said intra-osseous portion comprises a continuous thread about the cavity, said thread being supported by a plurality of ribs extending axially from said coronal portion and being affixed to said thread at points radially inwardly thereof, said ribs and thread defining the cavity and venting.

15 23. An implant post according to claim 1, wherein said intra-osseous portion comprises a plurality of ribs extending radially outwardly from the base of said coronal portion and being interconnected at a point axially extended therefrom and said ribs define the venting and the cavity.

20 24. An implant post according to claim 1, wherein said intra-osseous portion comprises a plurality of ribs curving gradually radially outwardly from the base of said coronal portion and being affixed to a base ring at points equally spaced around said ring.

25 25. An implant post according to claim 1, wherein said intra-osseous portion comprises an intermediate threaded portion joined to a base ring by a plurality of ribs.

30 26. An implant post according to claim 1, wherein said intra-osseous portion comprises an intermediate hollow conical portion capping a hollow cylindrical portion, said conical portion emanating from the base of said coronal portion to form an oblique apex angle and said hollows forming the cavity.

40 27. An implant post according to claim 26, wherein said cylindrical portion is pro-

vided with circular holes to form the venting.

28. An implant post according to claim 26, wherein said cylindrical portion is ribbed. 45

29. An implant post according to claim 26, wherein said cylindrical portion is constructed of rigid wide mesh material.

30. An implant post according to claim 1, wherein said intra-osseous member comprises a tubular member having a plurality of ports, to form the venting, symmetrically arranged about the longitudinal axis thereof and in a plane intermediate its ends, and a spring adapted to be seated within said tubular member and to extend through said vents and to be maintained so extended by the spring action. 50

31. An implant post according to claim 30, wherein said coronal portion is externally threaded at its lower portion and said tubular member is internally threaded at its upper portion, said coronal portion being screwed into said tubular member. 55

32. An implant post according to any one of claims 1 to 11 and 13 to 31 except as dependent on claim 12, wherein the coronal portion is axially aligned with the intra-osseous portion. 60

33. An implant post substantially as hereinbefore described with reference to and as illustrated in Figures 1, 2 or 3, 4 or 5, 6 or 7 or 8 or 9, 10 or 11 or 12 of the accompanying drawings. 65

STEVENS, HEWLETT & PERKINS,  
Chartered Patent Agents,  
5 Quality Court,  
Chancery Lane,  
London, W.C.2.  
Tel. 01-405 8393. 70

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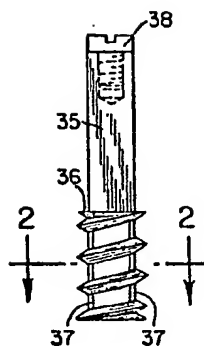


FIG. 1

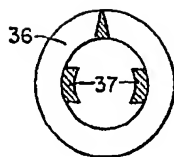


FIG. 2

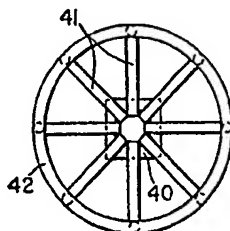


FIG. 4

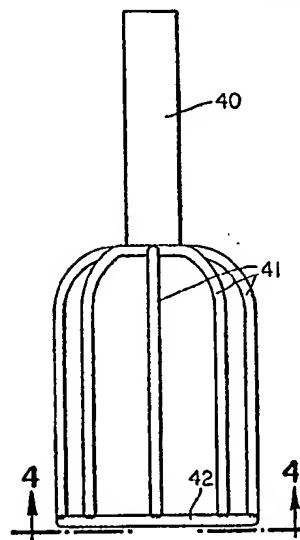


FIG. 3

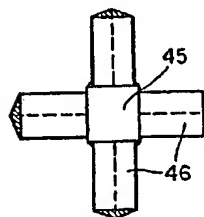


FIG. 6

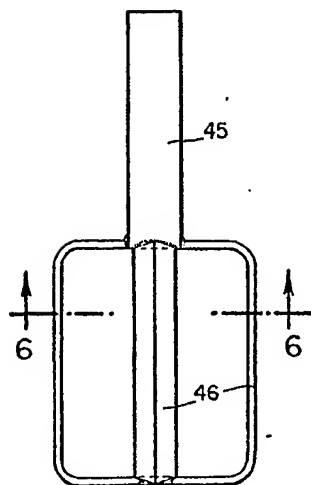


FIG. 5

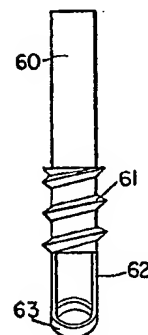


FIG. 7

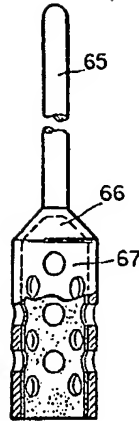


FIG. 8

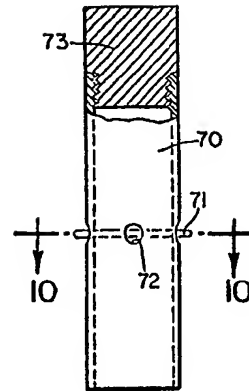


FIG. 9

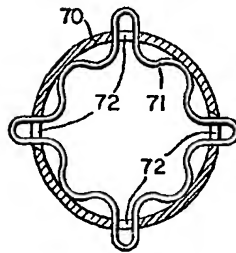


FIG. 10

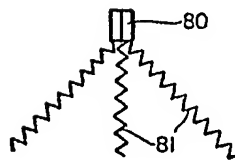


FIG. 12



FIG. 11